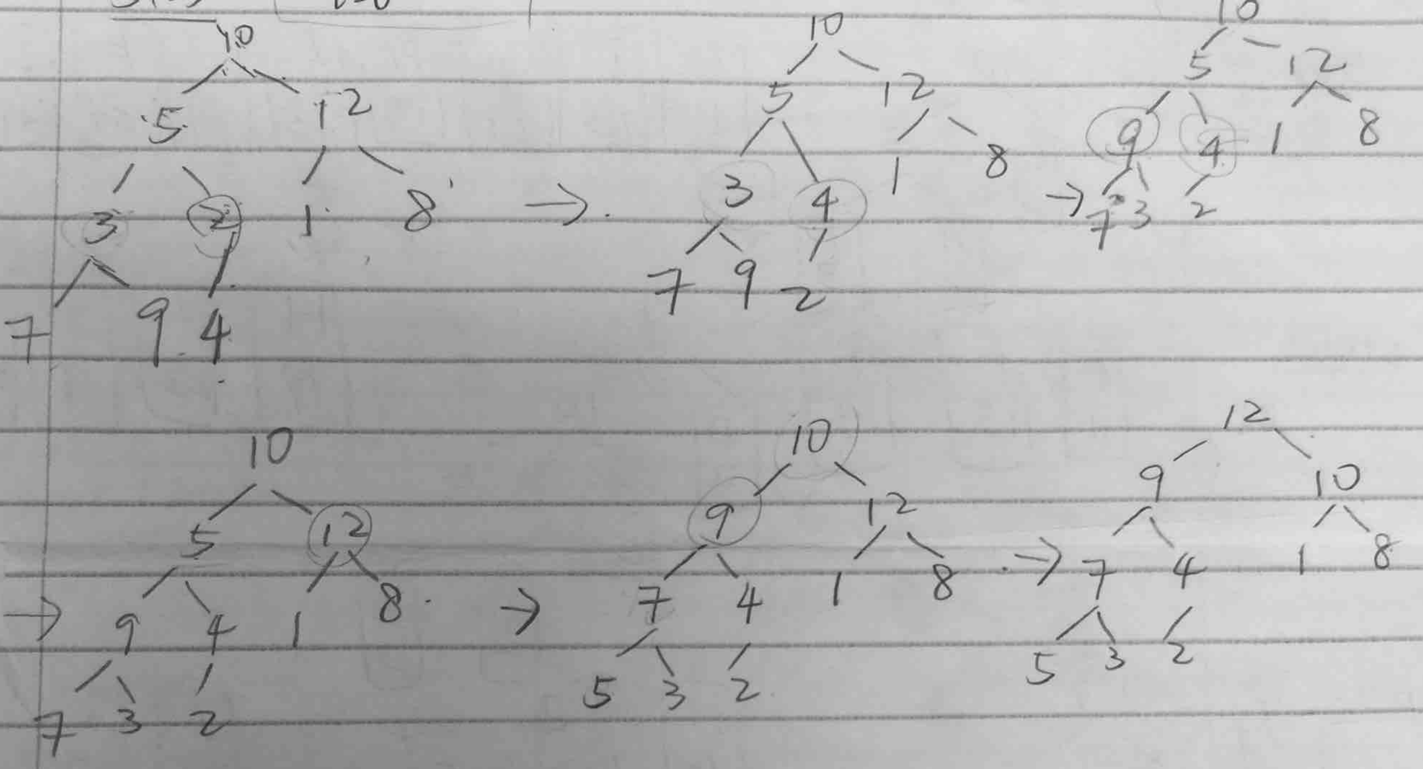
5.23

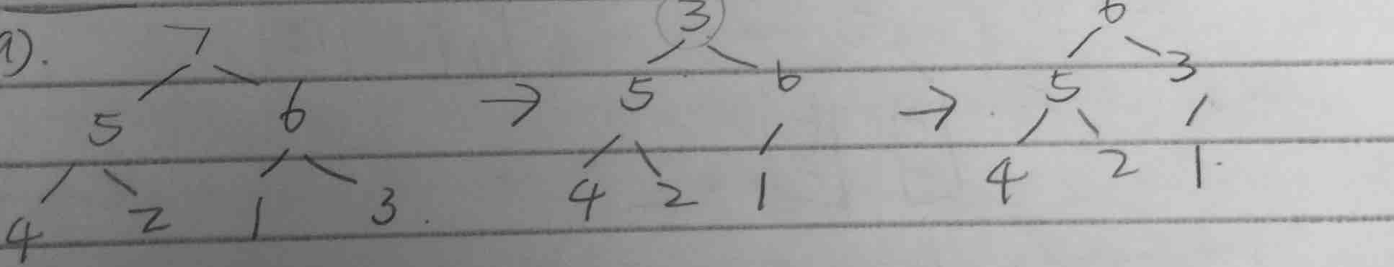
- min = $\boxed{\sum_{i=0}^{h-1} 2^{i} + 1}$
- max = $\sum_{i=0}^{h} 2i$

5.25

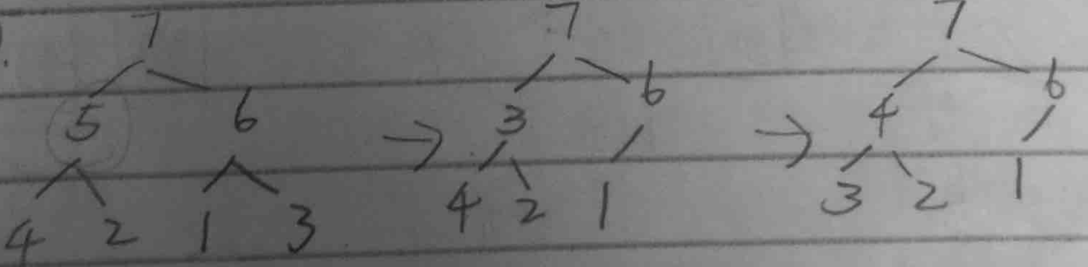


5.26

(a).

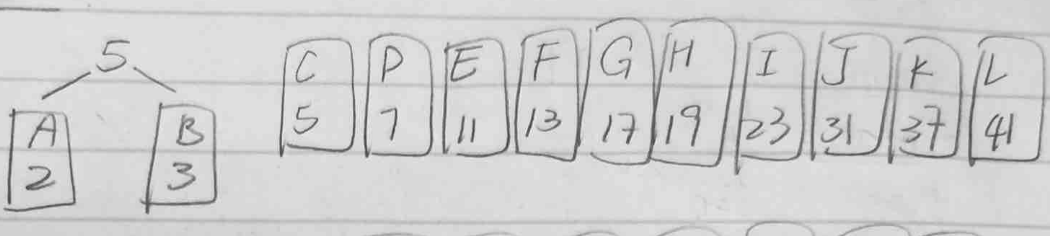


(b).

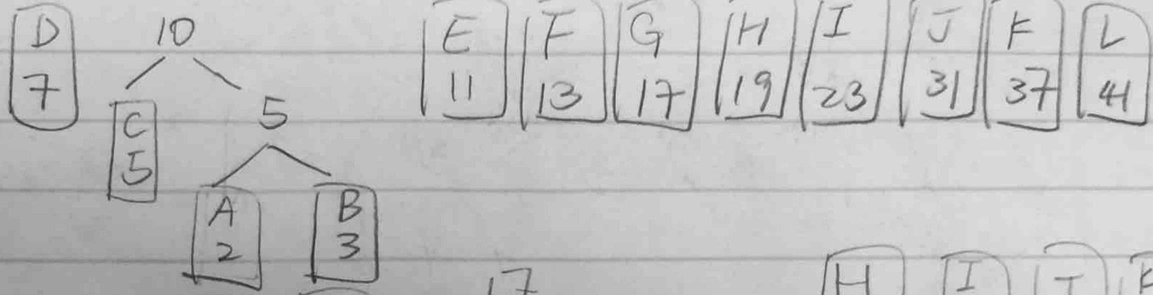


5.28

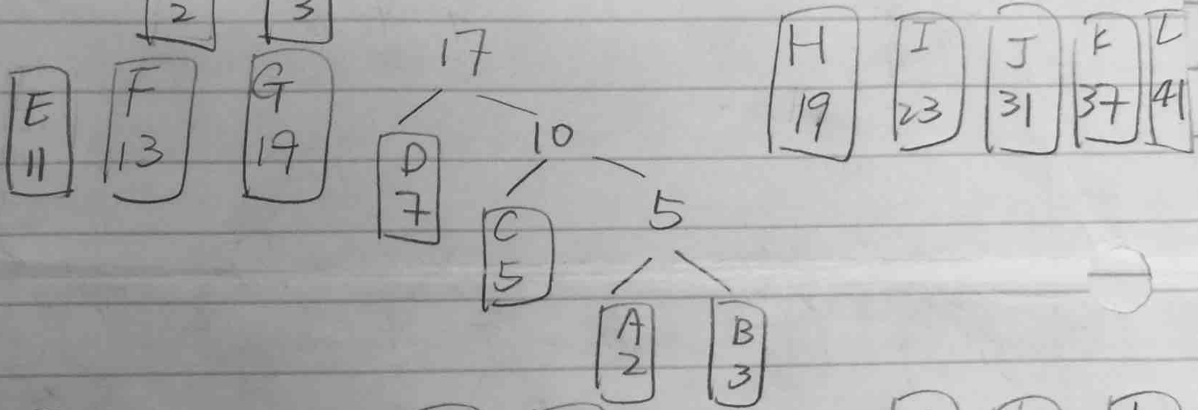
Step1:



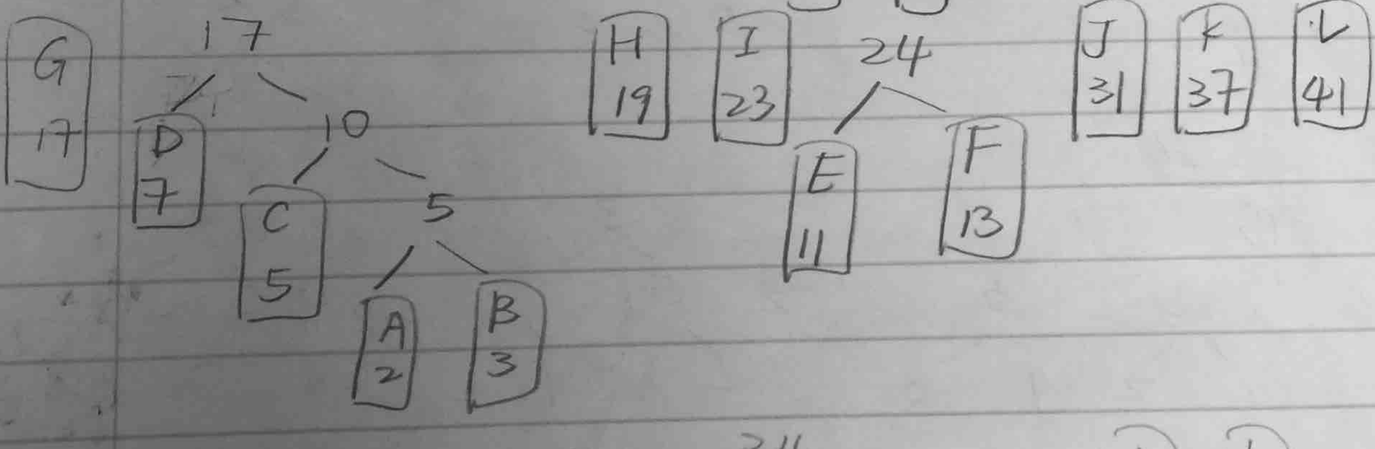
Step2 =



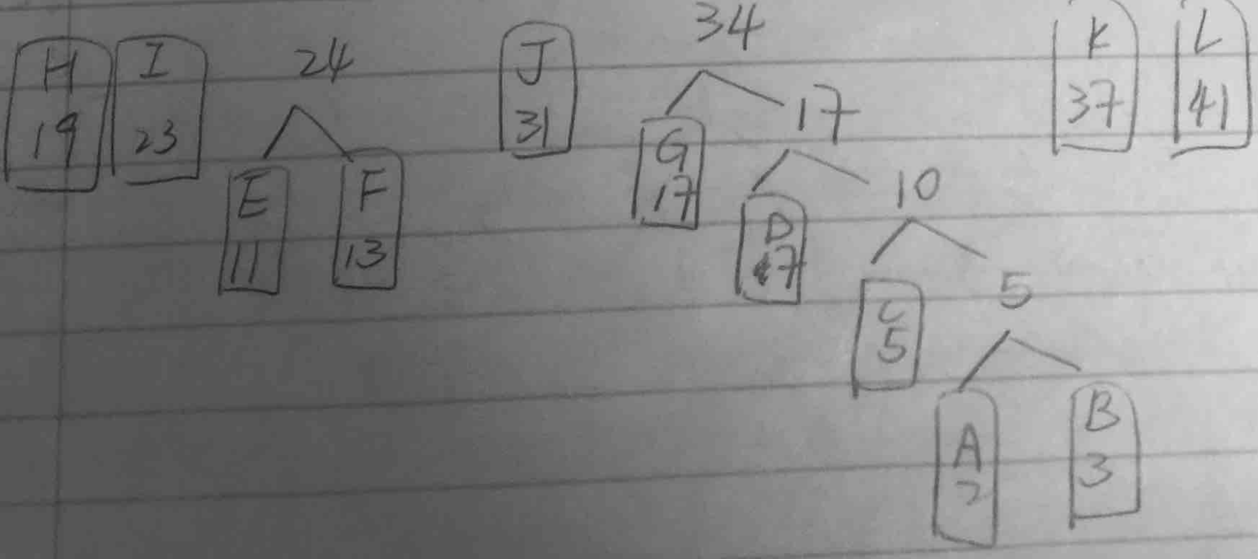
step3 :



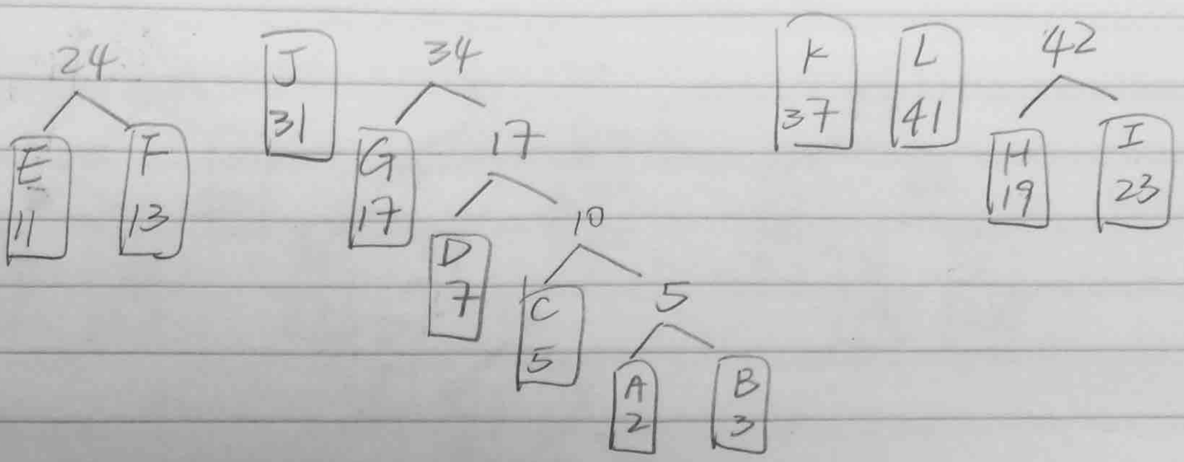
Step 4 :



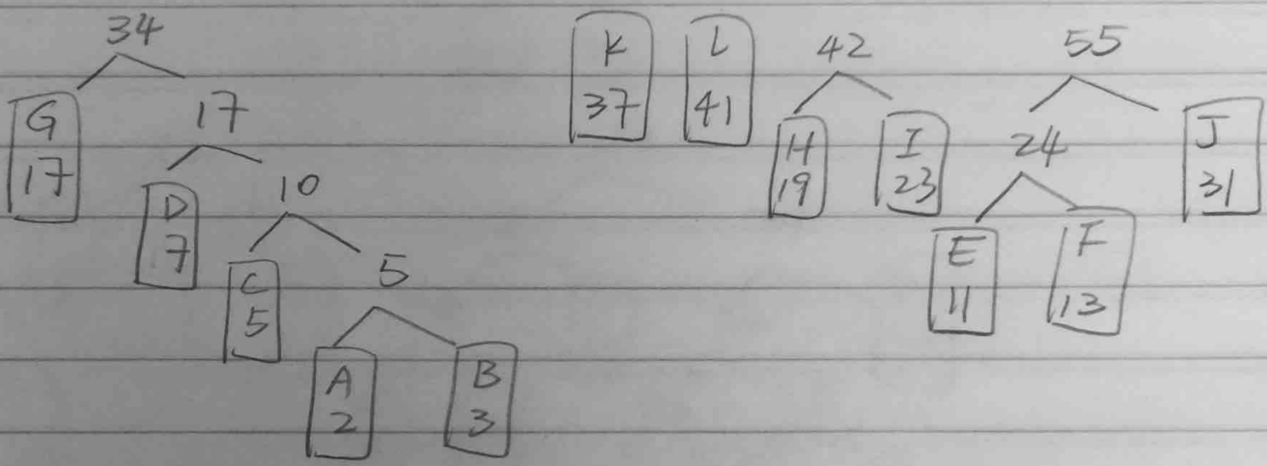
step5 :



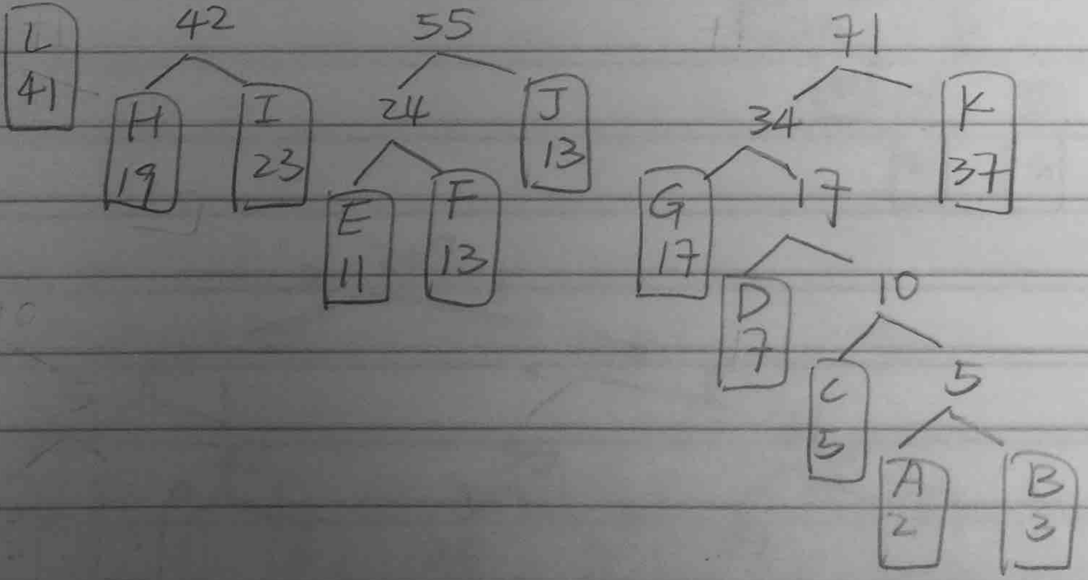
step 6:



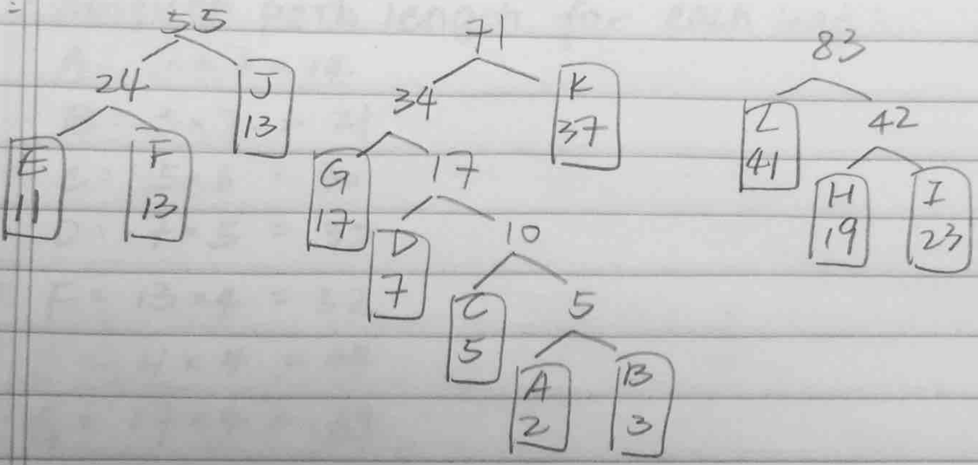
Step 7:



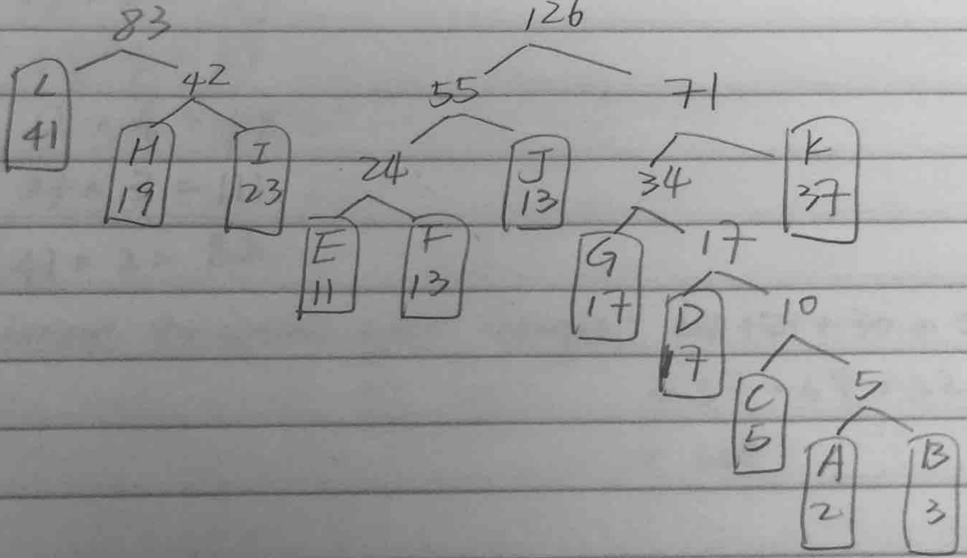
Step 8:



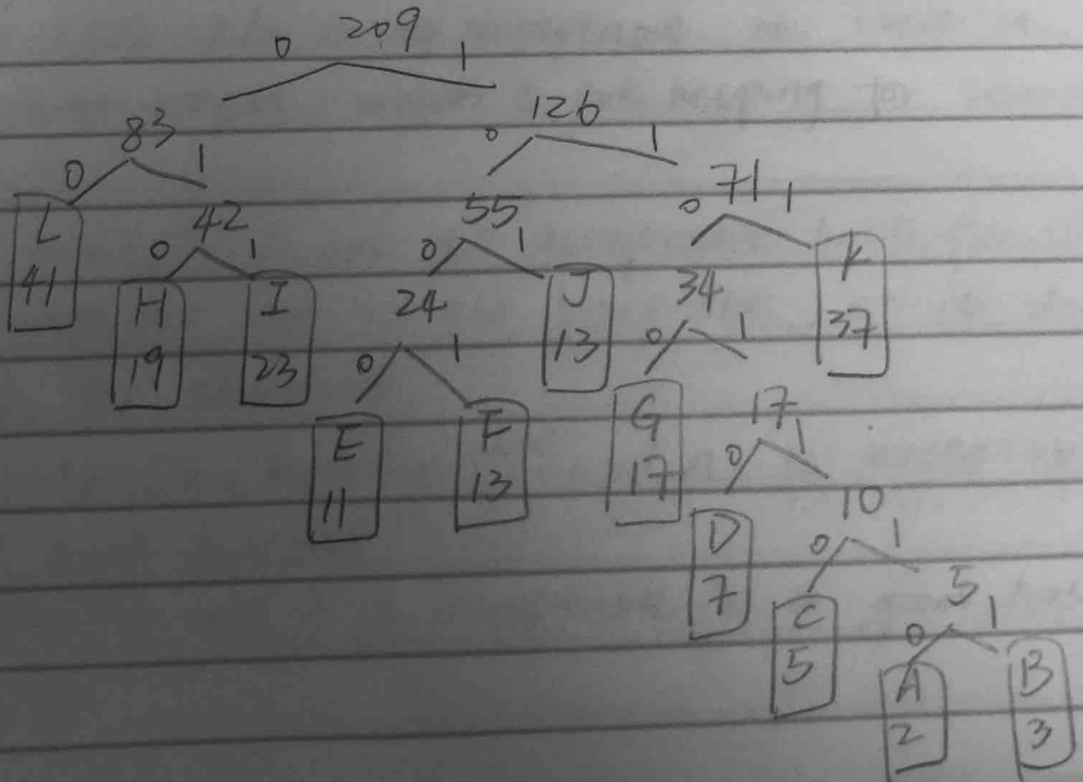
Step 9 :



Step 10 :



Step11 :



· weighted path length for each leaf =

A = 2×7 = 14
B = 3×7 = 21
C = 5×6 = 30
D = 7×5 = 35
F = 13×4 = 52
E = 11×4 = 44
G = 17×4 = 68
H = 19×3 = 57
I = 23×3 = 69
J = 13×4 = 52
K = 37×3 = 111.
L = 41×2 = 82.

minimum external path weight: 14+21+30+35+52+44+68
+57+69+52+111+82
= 608.

9.13.

(a). $h(k) = k/n$ is not acceptable, b/c there're too many collision exists, which is not helping for searching.

(b) $h(k) = 1$ is not an acceptable hash function b/c it maps all keys to the same slot, so it does not help for searching.

(c). $h(k) = (k + \text{Random}(n)) \bmod n$. is acceptable & is a good hash function.

(d) $h(k) = k \bmod n$ is acceptable & a good hash function.

9.16

m=10   ks = 3, 12, 9, 2, 79, 44.

	0		
5	1	2	
9	2	12	2
2	3	3	
1	4	44	
4	5		
8	6	79	
6	7		
3	8		
7	9	9	79

probability for each empty slot:

0: 0

5: 2/3

7: 1/3

8 = 0

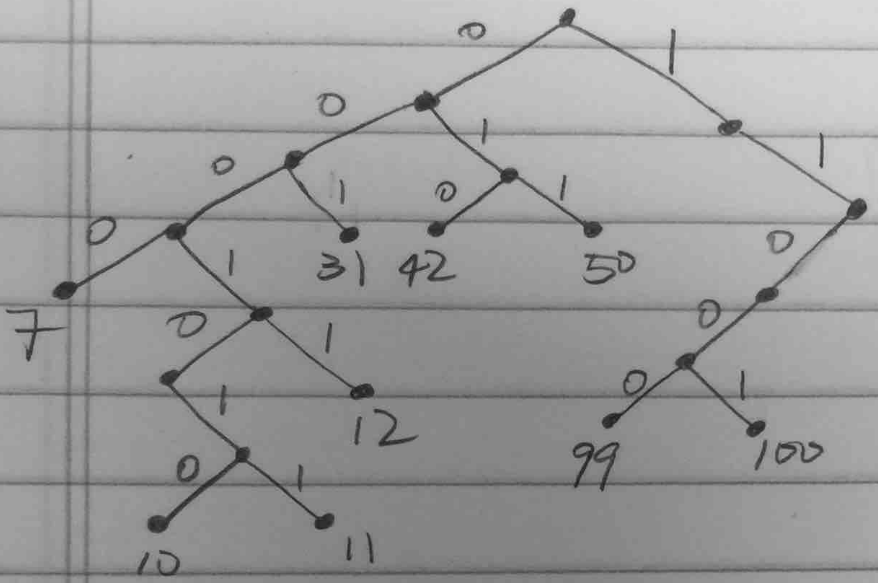
ercise 13.1.

42 12 100 10 50 31 7 11 99.

$2^7 = 128 > 100$, so each key is represented as a 7-bit value.

decimal	binary.	
42	0101010.	X
12	0001100	X
100	1100100	X
10	0001010	X
50	0110010	X
31	0011111	X
7	0000111.	
11	0001011	X
99	1100011	X

binary trie :


0
1
0
1
1
0
1
0
1
7
31
42
50
0
0
1
0
0
1
12
99
100
1
0
1
10
11